

TITLE OF THE INVENTION

COMBINED DVD/CD DATA PROCESSOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a DVD/CD player, and more particularly, to a combined DVD/CD data processor for use in the DVD/CD player.

2. Description of the Related Art

 A DVD (Digital Video Disk) player includes optical and servo systems of which functions and structures are similar to those used in a CD (Compact Disk) player. Therefore, in order to offer convenience to a user, there has been a demand for a DVD player compatible with the CD player.

 FIG. 1 illustrates a schematic block diagram of a combined DVD and CD player according to the state of the art. As illustrated, a spindle motor 12 rotates a disk 10 which is a DVD or a CD. An optical pickup 14 reads an RF (Radio Frequency) signal from the disk 10, and an RF amplifier 16 converts the RF signal read by the pickup 14 into a pulse stream, to generate an EFM (Eight to Fourteen Modulated) signal. A microprocessor 20 sets the DVD/CD player to a DVD mode or a CD mode, according to lead-in information received from the RF amplifier 16. A data processor 18 processes the EFM signal according to the set operation mode.

20 FIG. 2 illustrates the data processor 18 according to the prior art. In operation, the EFM signal is applied in common to a phase locked loop (hereinafter, referred to as PLL)24, a DVD data processor 26, and a CD data processor 38. The PLL 24 generates a PLL clock in synchronism with the EFM signal. The PLL clock is used for reproducing data recorded on the disk 10.

25 If the microprocessor 20 sets the DVD/CD player to the DVD or the CD mode according to the lead-in information, one of the DVD data processor 26 and the CD data processor 38 is selectively driven.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a combined DVD and CD data processor for use in a DVD/CD player.

Additional objects and advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

To achieve the above and other objects and advantages of the present invention, there is provided a combined DVD/CD data processor used in a DVD/CD player. The DVD/CD data processor includes a PLL to receive a pulse stream input to generate a PLL clock; a frame/ID synchronization detector to latch the pulse stream according to the PLL clock, to generate a symbol clock; a demodulator to EFM+ demodulate the pulse stream according to the symbol clock in a DVD mode, and to EFM demodulate the pulse stream according to the symbol clock in a CD mode; a memory to store the demodulated data; an ECC demodulator to error-correct the demodulated data stored in the memory according to a predetermined code length and error correction range, the predetermined code length and error correction range having different values in the DVD and CD modes; a descrambler to descramble the error corrected data stored in the memory, in the DVD mode; and a CD audio processor to process the error corrected data stored in the memory, in the CD mode.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of the present invention will become more apparent by describing in detail a preferred embodiment thereof, with reference to the attached drawings in which:

FIG. 1 is a schematic block diagram of a general DVD/CD player;

FIG. 2 is a detailed block diagram of a data processor of FIG. 1 according to the prior art;

FIG. 3 is a detailed block diagram of a data processor according to an embodiment of the present invention;

FIGS. 4 and 5 are diagrams illustrating memory maps of an external memory of FIG. 3 according to the embodiment of the present invention; and

FIG. 6 is a detailed block diagram of an ECC decoder shown in FIG. 3 according to the embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention will be described in detail, and it should be noted that like reference numerals denote the same components, and a detailed description of known function and structure of the present invention will be avoided if it is deemed to obscure the subject matter of the present invention.

A combined DVD/CD data processor according to the present invention is applicable to the DVD/CD player shown in FIG. 1, and the microprocessor 20 provides the DVD/CD data processor (the data processor 18 in FIG. 1) with mode setting information for setting the DVD or CD mode.

Referring to FIG. 3, the DVD/CD data processor according to an embodiment of the present invention includes a PLL 52, a frame/ID synchronization detector 54, an EFM/EFM+ demodulator 56, an external memory 58 including a DRAM (dynamic random access memory), a descrambler 60, an ECC decoder 62, and a CD audio processor 64.

The PLL 52 receives the EFM signal from the RF amplifier 16 to generate a PLL clock for restoring data, in synchronism with the received EFM signal. The frame/ID synchronization detector 54 latches the EFM signal according to the PLL clock, and detects frame synchronization and ID synchronization signals to generate a symbol clock. The EFM/EFM+ demodulator 56 selectively performs EFM or EFM+ demodulation according to the mode setting information generated from the microprocessor 20. That is, if the mode setting information indicates the DVD mode (the microprocessor 20 controls the combined DVD/CD data processor to set the DVD/CD player to a DVD mode or a CD mode according to lead-in information received from the RF amplifier 16 and provides the mode setting information for the EFM/EFM+ demodulator 56, the ECC decoder 62 and the CD audio processor 64), the EFM/EFM+ demodulator 56 EFM+ demodulates the EFM signal according to the symbol clock. On the contrary, if the mode setting information indicates the CD mode, the EFM/EFM+ demodulator 56 EFM demodulates the EFM signal according to the symbol clock. Such demodulated data is stored into the external memory 58.

The external memory 58 has a memory map as shown in FIGs. 4 and 5. In the DVD mode, the external memory 58 has 13 ECC blocks each having 32.25-Kbytes to store 13 ECC blocks, as shown in FIG. 4. The external memory 58 is configured to provide a VBR (Variable Bit Rate) control margin for interfacing VBR coded AV data with an AV decoder (not shown). In the CD mode, a specified part, i.e., 32bytes x 256 frames, of the external memory 58 is used, as shown in FIG. 5.

Referring back to FIG. 3, the ECC decoder 62 reads and corrects the data stored in the external memory 58 according to the mode setting information. The ECC decoder 62 has a construction as shown in FIG. 6.

Referring to FIG. 6, the ECC decoder 62 includes a syndrome generator 66, a modified syndrome calculator 68, an erasure constant generator 70, a modified Euclidean algorithm 72, a Chien search and error correction circuit 74.

In the DVD mode, the syndrome generator 66 sets a code length and a correction range to PI(182,172), PO(208,192) and thereafter, receives data from the external memory 58 to generate a syndrome polynomial $S(X)$. In the CD mode, the syndrome generator 66 sets the code length and correction range to C1(32,28), C2(28,24) and thereafter, receives the data from the external memory 58 to generate the syndrome polynomial $S(X)$. The generated syndrome polynomial $S(X)$ is applied to the modified syndrome calculator 68. The erasure constant generator 70 is provided with an erasure flag to generate an erasure constant a^k to the modified syndrome calculator 68. The modified syndrome calculator 68 receives the syndrome polynomial $S(X)$ and the erasure constant a^k to calculate a Forney syndrome polynomial $T(X)$ and an erasure locator polynomial $E(X)$. The calculated Forney syndrome polynomial $T(X)$ and erasure locator polynomial $E(X)$ are applied to the modified Euclidean algorithm 72. The modified Euclidean algorithm 72 processes the Forney syndrome polynomial $T(X)$ and the erasure locator polynomial $E(X)$ based on the modified Euclidean algorithm, to generate an errata locator polynomial $W(X)$ and an errata evaluator polynomial $\Lambda(X)$. The Chien search and error correction circuit 74 receives the errata locator polynomial $W(X)$ and the errata evaluator polynomial $\Lambda(X)$ to correct errors of the corresponding data and store the error corrected data back into the external memory 58.

Since the primitive polynomials for error-correcting the DVD data and the CD data are the same to each other, it is possible to correct the DVD and CD data by controlling only the data received from the syndrome generator 66, with use of the single ECC decoder 62. The primitive polynomial P(X) is represented by:

$$P(X) = x^8 + x^4 + x^3 + x^2 + 1 \dots \dots \dots (1)$$

That is, the primitive polynomials for correcting the DVD and CD data are the same to equation (1), and merely, the code lengths and correction ranges of the DVD and CD data to be error-corrected are different from each other. Therefore, by simply controlling the code length and the correction range of the input data according to the set mode, it is possible to correct errors of the DVD and CD data through the use of the single ECC decoder 62.

Referring again to FIG. 3, in the case that the DVD/CD player is set to the DVD mode, the descrambler 60 is enabled to descramble the error corrected data stored in the external memory 58 and provide the descrambled output data to the ATAPI (not shown) or the AV decoder (not shown).

In case the DVD/CD player is set to the CD mode, the CD audio processor 64 is enabled to process the error corrected data stored in the external memory 58.

As can be appreciated from the foregoing, the DVD/CD data processor according to the present invention includes a single ECC decoder for correcting both the DVD and CD data, and a single external memory. Therefore, the DVD/CD data processor is simple in structure, thereby resulting in a decrease of the manufacturing cost.

While the invention has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims.